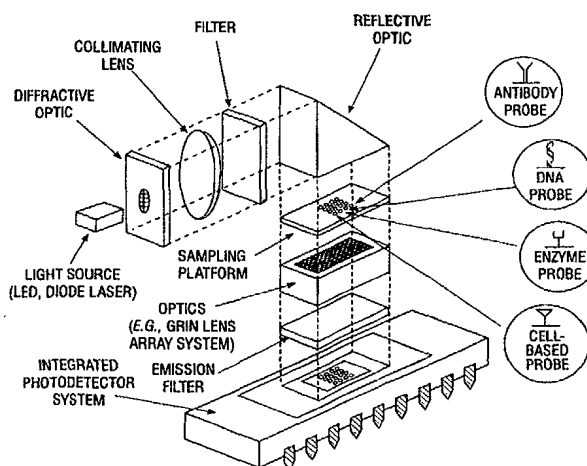


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International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>C12Q 1/68</b>		<b>A2</b>	<b>(11) International Publication Number:</b> <b>WO 00/43552</b>
			<b>(43) International Publication Date:</b> 27 July 2000 (27.07.00)
<b>(21) International Application Number:</b> PCT/US00/02051 <b>(22) International Filing Date:</b> 25 January 2000 (25.01.00)  <b>(30) Priority Data:</b> 09/236,758      25 January 1999 (25.01.99)      US  <b>(71) Applicant (for all designated States except US):</b> LOCKHEED MARTIN ENERGY RESEARCH CORPORATION [US/US]; Oak Ridge National Laboratory, P.O. Box 2009, Oak Ridge, TN 37831 (US).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> VO-DINH, Tuan [US/US]; Oak Ridge National Laboratory, 701 Scarboro Road, P.O. Box 20080 - MS 6101, Oak Ridge, TN 37831 (US).  <b>(74) Agent:</b> MOORE, Mark, D.; Williams, Morgan & Amerson, P.C., Suite 250, 7676 Hillmont, Houston, TX 77040 (US).			<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>Without international search report and to be republished upon receipt of that report.</i>

**(54) Title:** MULTIFUNCTIONAL AND MULTISPECTRAL BIOSENSOR DEVICES AND METHODS OF USE**(57) Abstract**

Disclosed are advanced multifunctional biochip devices capable of specifically detecting and quantitating multiple biomolecular target compounds, such as polypeptides, polynucleotides, and other intracellular and extracellular biomolecules. In illustrative embodiments, the miniaturized multifunctional biosensor device comprises multiple biological sensing elements, excitation micro-lasers, a sampling waveguide equipped with optical fluorescence detectors, integrated electro-optics, a bio-telemetric radio frequency signal generator, and a plurality of molecular probes, all contained on a single integrated circuit, or "biochip". The biochip is suitable for multi-gene analysis, and multi-peptide detection, as well as simultaneous detection and quantitation of polynucleotide and polypeptide species using a single biochip device. Also disclosed are methods that permit rapid, large-scale, and cost-effective production of such biochip devices, as well as their use in the detection and quantitation of multiple species in a single mixed biological sample.